Introduction

In 2008 ConocoPhillips initiated a Life of Field Seismic (LoFS) reservoir monitoring project for the Ekofisk field. The objective was to increase understanding of reservoir depletion zones and intra-reservoir injected water expansion fronts and thus help placing production wells with higher precision (Folstad 2010a and 2010b, Eriksrud 2010). Early in 2010 ConocoPhillips teamed up with CGGVeritas to deliver the main elements of the seismic delivery chain for the project. One of the key business drivers for such a unified partnership was the idea of creating additional value through seamless communication with a single fully integrated team comprising all acquisition aspects, data acquisition QC and finally processing, imaging and geosciences. In this paper, we show in more detail the structure of the project organisation and discuss the projected as well as the benefits realised to date.

The Ekofisk LoFS Operation

The Ekofisk LoFS operation employs a trenched Optoplan fibre optics seismic system which will allow for cost-efficient, high-quality and highly repeatable 4D/4C seismic surveys twice a year. A map showing the final layout of the Ekofisk OBC system is shown in figure 1.

![Figure 1](image_url)

The layout of the Ekofisk LoFS OBC system and various installations and obstructions.

Figure 2 shows the main components of the Ekofisk LoFS operation. The trenched 4C cables are connected to the top-side recording system (LIM) which itself is connected with a dedicated fibre optic link to the ConocoPhillips (CoP) offices in Stavanger. During acquisition data is being transmitted near real time to the CoP offices where we the operations centre (see figure 3) consists of a co-located on-shore acquisition QC team and the dedicated processing team. Co-location of the processing and reservoir geophysics teams has proven to be an extremely valuable concept, particularly for 4D operations. A major benefit of this arrangement is the short communication path, which is key in achieving the turnaround required for the 4D processing. Continuity of staff and expertise is also important. Furthermore, CGGVeritas has positioned a senior researcher in this operations centre. In collaboration with R&D in Oslo and other centres, this gives ConocoPhillips access to the wider R&D community of CGGVeritas and should benefit both parties in delivering new technologies on live data. In addition co-location of the acquisition QC within this operation delivers even more connected information. One of the main benefits here is the use of the same software, algorithms and formats between the two teams. The data comes in from the LIM via a fibre-optic link, is re-formatted and QCd. QC reports are generated and shared simultaneously with the client and the processing team. The data are then also immediately available to the processing team to perform in
situ the first analysis steps such as denoise and vector rotations before being transferred to the main processing hub in the UK. All secondary information (i.e. source QC's, water temperature measurements) is also available to all teams within ConocoPhillips and CGGVeritas at once. With the LoFS1 data (the base for the subsequent 4Ds) we are currently collating a database of the various types of acquisition noises on the data and attempting to find efficient ways to potentially inform the acquisition that certain noise type can be processed away; this has clear impact on cost.

**Figure 2**
Main components of the Ekofisk operation with their links.

**Conclusions**

The Ekofisk LoFS project is still in its early stages and concluding on achieved cost efficiencies is premature. However, what is already clear is that an operation as complex as this is made significantly easier by integrating the various elements into one single operation. To date the most visible benefits of this approach are the simplified communication and the efficiency gain by reducing the transfer times of the data between acquisition, QC and processing. We hope to realise more efficiencies particularly at the interface of acquisition QC and processing as we progress.

**Figure 3**
The LoFS operations centre run by CGGVeritas in ConocoPhillips’ Stavanger offices. To the right of the glass doors is the acquisition QC team, to the left, the co-located processing group and R&D.
Acknowledgments

We thank the managements of the Ekofisk license (ConocoPhillips Norge AS, Total E&P Norge AS, ENI Norge AS, Statoil Petroleum AS and Petoro AS) and CGGVeritas for permission to publish. We acknowledge the work of all our colleagues involved with the Ekofisk LoFS project.

References

